NPL-U33-2-6-R9

HRS DOCUMENTATION RECORD—REVIEW COVER SHEET

Name of Site:	**ALARK HARD CHROME**	
Contact Person:	Carolyn Douglas, EPA Region 9	(415) 744-2343
Site Investigation:	Kate Dragolovich, Ecology and Environment, Inc.	(415) 981-2811
Documentation Record:	Kate Dragolovich, Ecology and Environment, Inc.	(415) 981-2811

Pathways, Components, or Threats Not Scored:

The environmental threat for the surface water pathway was evaluated, but not scored, because there are no known sensitive environments associated with the in-water segment (i.e., Springbrook Channel, Fairmount Lake, and Lake Evans).

The soil exposure and air pathways were evaluated, but not scored, because the tanks associated with the electroplating process are no longer on site and a majority of the site surface, both inside and outside the building, is covered with concrete.

HRS DOCUMENTATION RECORD

Name of Site:	**ALARK HARD CHROME**	
EPA ID#:	CAD098229214	
EPA Region:	9	Date Prepared: January 11, 1999
Street Address of Site:	2777 Main Street, Riverside	
County and State:	Riverside County, California	
Topographic Map:	Riverside East	
Latitude: 33º 59' 30.79" N.		Longitude: 117º 22' 1.88" W.

Scores

Ground Water Pathway	100
Surface Water Pathway	14.13
Soil Exposure Pathway	Not scored
Air Pathway	Not scored
HRS SITE SCORE	50.50

(Complete pathway scoresheets are included at the end of this documentation record.)

REFERENCES

Reference
Number   Description of References

1. *Code of Federal Regulations (CFR)*, Title 40 Part 300, Appendix A, Hazard Ranking System.

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3. U.S. Geological Survey, Maps of Riverside East and Riverside West, California, 7.5-Minute Series photorevised 1980.

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9. LePen, Pam, California Environmental Protection Agency, Department of Toxic Substances Control (DTSC), memorandum to Mike Thorne, Bechtel Environmental, Inc., re: July 1990 DTSC Soil Sampling Results, August 18, 1992. 25 pp.

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19. LePen, Pam, DTSC, letter to Karen Ladd, Ecology and Environment, Inc., re: March 1991 DTSC Soil Sampling Results and April/May 1991 DTSC Ground Water Sampling Results, September 13, 1991. 20 pp.

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21. McMeans, Gene, Riverside Highland Water Company, telephone conversation with Kate Dragolovich, Ecology and Environment, Inc., re: Riverside Highland Water Company's Drinking Water System, May 21 and 28, 1998. 1 p.

22. Appel, Steve, Rubidoux Community Services District, telephone conversation with Kate Dragolovich, Ecology and Environment, Inc., re: Rubidoux's Drinking Water System, May 26 and 27, 1998. 2 pp.

23. Rust Remedial Services, <u>Final Report: Alark Hard Chrome Soil Excavation and Removal</u>, October 11, 1994. 48 pp.

24. Mains, Steve, Western Municipal Water District, telephone conversation with Mike Thorne, Bechtel Environmental, Inc., re: Ground Water, July 6, 1992. 1 p.

25. Mains, Steve, Western Municipal Water District, telephone conversation with Mary Osborne, State of Calfornia Department of Health Services, re: Riverside Basin, April 4, 1984. 1 p.

26. Bechtel, <u>Site Inspection Prioritization</u>, Alark Hard Chrome, March 29, 1993. 76 pp.

27. Asam, Mike, City of Riverside, Parks and Recreation Department, telephone conversation with Kate Dragolovich, Ecology and Environment, Inc., re: Fish Catch Data, September 9, 1998. 1 p.

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FIGURES

SOURCE DESCRIPTION

2.2 Source Characterization

Source Description: Source 1 — Plating Tank Spillage

Alark Hard Chrome was an electroplating shop that operated from 1971 to 1985 (ref. 11, p. 2). Eighteen open plating tanks (one 300-gallon cadmium solution tank; one 300-gallon nickel solution tank; four chromium solution tanks with volumes of 2,100 gallons, 1,400 gallons, 670 gallons, and 300 gallons; 10 200-gallon rinsing tanks; and two soaking tanks of unknown size) were used in the electroplating process (ref. 7, p. 2, Figure 2; ref. 15, p. 1). The tanks were set directly on the ground in "cut outs" in the concrete floor. As metal parts were lifted out of each tank, the plating solution would drip and spill onto the floor and into the 3-inch to 5-inch gap between the tank and the floor (ref. 4, p. 11, Figure 4; ref. 5, p.1; ref. 6, p. 1; ref. 7, p. 7).

The owners of Alark Hard Chrome closed the electroplating shop and took the plating tanks off site in November 1985 (ref. 10, pp. 3 and 6). However, contaminated soil resulting from the plating tank spillage is still present on site (ref. 9, pp. 2, 13, 14, 15, 16, and 19; ref. 19, pp. 2 and 4; ref 23, Attachment 5, p. 5-3, Attachment 6, pp. 6-8 and 6-16). See Section 2.2 (Source Description) for Source 4 (Contaminated Soil) for a discussion of contaminated soil associated with the Alark Hard Chrome site.

Source Type

The source type for the plating tank spillage is "other" (ref. 1, Table 2-5).

Source Location

The plating tanks were located in the front and middle rooms of the on-site building (ref. 7, p. 2, Figure 2). Figure 1 shows the former locations of the plating tanks and, therefore, the locations of the spillage.

Source Containment

Gas and Particulate Release to Air

Sometime in the mid to late 1980s, after the cadmium solution, rinsing, and soaking tanks were removed, the floor of the front room was capped with concrete (ref. 8, p. 3). In 1994, the floor of the middle room was also capped with concrete (ref. 23, p. 5). Since Source 1 is covered with an essentially impermeable cover, the gas and particulate containment factors are assigned values of 0 (ref. 1, Tables 6-3 and 6-9).

Release to Ground Water

The plating tanks were set directly on the ground in "cut outs" in the concrete floor. As metal parts were lifted out of each tank, the plating solution would drip and spill onto the floor and into the 3-inch to 5-inch gap between the tank and the floor (ref. 4, p. 11, Figure 4; ref. .5, p.1; ref. 6, p. 1; ref. 7, p. 7). A ground water containment factor value of 10 is assigned for "no liner" (ref. 1, Table 3-2).

Release to Surface Water

Although any plating tank spillage currently on site is covered by a concrete cap, this was not the case when the electroplating shop was in operation and the aboveground plating tanks were in place. In addition, there does not appear to have been any runoff management system to prevent spillage from reaching the outside via a large roll-up door in the rear wall of the middle room (ref. 5, p. 1; ref. 8, Attachment A, pp. A-1 and A-3). Since the spillage was not equipped with a maintained engineered cover and run-on control/runoff management system, a surface water containment factor value of 10 is assigned (ref. 1, Table 4-2).

A copy of Figure 1 is available at the EPA Headquarters Superfund Docket:

U.S. CERCLA Docket Office
Crystal Gateway #1, 1st Floor
1235 Jefferson Davis Highway
Arlington, VA 22202

Telephone: (703) 603-8917
E-Mail: superfund.docket@epa.gov

2.4.1. Hazardous Substances

Based on industrial process literature and an interview with the Alark Hard Chrome owners, the following information is available regarding the solutions in the plating tanks:

The solution for the chromium plating tanks was prepared using a ratio of chromic acid (CrO_3) to sulfuric acid of 100:1 (wt./wt.). The pH of the solution was very acidic, normally between 0 and -1. Conductivities of the solution were between 600 to 700 micromhos/centimeter (μmhos/cm), and the solution specific gravities were 1.6 to 1.7. These conditions kept chromium in its most oxidized state (hexavalent chromium), since the presence of lesser oxidation states reduced plating efficiency (ref. 13, p. 5; ref. 15, p. 1).

The solution for the cadmium plating tank was cadmium complexed with cyanide ($Cd(CN)_4^{2-}$) (ref. 13, p. 5).

The solution for the nickel plating tank consisted of a dissolved solution of nickel sulfate and nickel chloride. The pH of the bath was usually maintained at 2 (ref. 13, p. 5).

The hazardous substances associated with the spillage from the plating tanks are:

- total chromium
- hexavalent chromium
- cadmium
- cyanide
- nickel

2.4.2 Hazardous Waste Quantity

Tier A: Hazardous Constituent Quantity

There is insufficient information to document the hazardous constituent quantity of the spillage from the plating tanks.

Hazardous Constituent Quantity Value: 0

<u>Tier B: Hazardous Wastestream Quantity</u>

There is insufficient information to document the wastestream quantity of the spillage from the plating tanks.

Hazardous Wastestream Quantity Value: 0

Tier C: Source Volume

Since the plating tanks were part of Alark Hard Chrome's electroplating process, they contained chemical products that are not considered hazardous substances under CERCLA; therefore the volumes of the tanks cannot be used to document hazardous waste quantity. Although the spillage from the plating tanks is considered to contain hazardous substances under CERCLA because the material is a waste, there is insufficient information to document the volume of this source.

Dimension of Source (yd^3): unknown
Volume Assigned Value: >0

Tier D: Source Area

There is insufficient information to document the area of spillage from the plating tanks.

Area of Source (ft^2): unknown
Area Assigned Value: 0

Source Hazardous Waste Quantity

The hazardous waste quantity associated with this source is greater than 0, but unknown.

Source Hazardous Waste Quantity: >0

SOURCE DESCRIPTION

2.2 Source Characterization

Source Description: Source 2 —Disposal Pit

During 1982 investigations of the Alark Hard Chrome site, personnel from the Riverside County Department of Health discovered an abandoned "seepage pit" in the middle room of the electroplating shop. The pit had a concrete cap on it and its dimensions were approximately 40 feet deep and 4 feet in diameter. An informant told the Riverside County personnel that seepage pits located under the concrete shop floor were used to discharge plating solutions (ref. 5, p. 1).

In 1994, a contractor to the California Environmental Protection Agency, Department of Toxic Substances Control (DTSC) excavated 1,207.73 cubic yards of contaminated soil from a 26-foot wide by 30-foot long area in the middle room of the electroplating shop where the pit was located (ref. 23, pp. 1 and 5, Attachment 4, p. 4-38, Attachment 5, p. 5-3). However, contaminated soil resulting from disposal of plating solutions in the pit is still present on site (ref 23, Attachment 5, p. 5-3, Attachment 6, pp. 6-2, 6-3, 6-6, 6-10, 6-12, and 6-14). See Section 2.2 (Source Description) for Source 4 (Contaminated Soil) for a discussion of contaminated soil associated with the Alark Hard Chrome site.

Source Type

The source type for the diposal pit is "other" (ref. 1, Table 2-5).

Source Location

The pit was located in the middle room of the on-site building (ref. 7, Figure 2). Figure 1 shows the former location of the pit.

Source Containment

Gas and Particulate Release to Air

Following the 1994 soil removal activities, the entire middle room was capped with a 2-foot thick layer of gravelly sand, followed by a 1-foot thick layer of clay, followed by another 2-foot thick layer of sand and a 4-inch thick concrete slab (ref. 23, pp. 5). Since Source 2 is covered with a layer of uncontaminated soil that is greater than 3 feet thick, as well as an essentially impermeable concrete cap, the gas and particulate containment factors are assigned values of 0 (ref. 1, Tables 6-3 and 6-9).

Release to Ground Water

Source 2 was a "seepage pit" used for the disposal of plating solutions (ref. 5, p.1). A ground water containment factor value of 10 is assigned for "no liner" (ref. 1, Table 3-2).

Release to Surface Water

Although any remaining contamination associated with the disposal pit is currently covered by a concrete cap, this was not the case when the electroplating shop was in operation. In addition, there does not appear to have been a runoff management system to prevent overflow from reaching the outside via a large roll-up door in the rear wall of the middle room (ref. 5, p. 1; ref. 8, Attachment A, pp. A-1 and A-3).

Since the disposal pit was not equipped with a maintained engineered cover and run-on control/runoff management system, a surface water containment factor value of 10 is assigned (ref. 1, Table 4-2).

2.4.1. Hazardous Substances

The pit was used for the disposal of solutions from the plating tanks (ref. 5, p. 1). Based on industrial process literature and an interview with the Alark Hard Chrome owners, the chromium plating solution consisted of chromic acid and sulfuric acid, the cadmium plating solution consisted of cadmium complexed with cyanide, and the nickel plating solution consisted of nickel sulfate and nickel chloride (ref. 13, p. 5; ref. 15, p. 1).

The hazardous substances associated with the disposal pit are:

- total chromium
- hexavalent chromium
- cadmium
- cyanide
- nickel

2.4.2 Hazardous Waste Quantity

Tier A: Hazardous Constituent Quantity

There is insufficient information to document the hazardous constituent quantity for the disposal pit.

Hazardous Constituent Quantity Value: 0

Tier B: Hazardous Wastestream Quantity

There is insufficient information to document the hazardous wastestream quantity for the disposal pit.

Hazardous Wastestream Quantity Value: 0

Tier C: Source Volume

The disposal pit was approximately 40 feet deep and 4 feet in diameter (ref. 5, p. 1). Therefore, the volume of Source 2 is 503 cubic feet (3.1416 x 2-foot radius^2 x 40-foot height) or 19 cubic yards (503 cubic feet divided by 27 cubic feet/cubic yard). After applying the Tier C divisor of 2.5 for "other," the source volume value for Source 2 is 7.6 (ref. 1, Table 2-5).

Dimensions of Source (yd^3): 19
Volume Assigned Value: 7.6

Tier D: Source Area

Since the volume of Source 2 has been determined, the area measure was not evaluated (ref. 1, Section 2.4.2.1.3).

Area of Source (ft^2): N/A
Area Assigned Value: 0

Source Hazardous Waste Quantity

Tier C, Source Volume, provides thet source hazardous waste quantity value for Source 2.

Source Hazardous Waste Quantity: 7.6

SOURCE DESCRIPTION

2.2 Source Characterization

Source Description: Source 3 —Underground Holding Tank

Water from washdowns in the plating areas flowed into three floor drains. These drains were routed to a 500-gallon underground holding tank located outside the rear of the building The water was stored in the holding tank for reuse as makeup water in the plating tanks (ref. 7, p. 2, Figure 2; ref. 12, p. 2-4). Once the capacity of the tank was reached, the contents were to be removed for disposal. However, it does not appear that the tank was ever pumped out (ref. 7, pp. 2 and 8).

The underground holding tank was taken off site sometime during the mid or late 1980s (ref. 8, p. 3). However, it is not known whether or not the tank was disposed of at a Resource Conservation and Recovery Act (RCRA) or Toxic Substances Control Act (TSCA) permitted facility.

Source Type

The source type for the underground holding tank is "tanks and containers other than drums" (ref. 1, Table 2-5).

Source Location

The underground holding tank was located to the rear (i.e., outside the northwest corner) of the on-site building (ref. 7, p. 2, Figure 2; ref. 9, p. 2). Figure 1 shows the former location of the tank.

Source Containment

Gas Release to Air

The hazardous substances associated with Source 3 are total chromium, hexavalent chromium, cadmium, cyanide, and nickel (ref. 13, p. 5; ref. 15, p. 1). Total chromium, hexavalent chromium, cadmium, cyanide, and nickel are not gaseous hazardous substances (ref. 2, pp. B-4, B-5, B-6, and B-14). Gas potential to release an only be evaluated for those sources that contain gaseous hazardous substances (ref. 1, Section 6.1.2.1).

Particulate Release to Air

The underground holding tank was used exclusively for the disposal of liquids (i.e., washdown water) (ref. 5, p. 1). Therefore, a particulate containment factor value of 0 is assigned (ref. 1, Table 6-9).

Release to Ground Water

In 1990, soil samples were collected from a boring (B16) located adjacent to the former location of the underground holding tank (ref. 9, p. 2). Analytical results indicated the presence of total chromium at concentrations significantly above background levels in the samples collected at 5 feet, 10 feet, and 20 feet bgs (ref. 9, pp. 6, 17, 20, 21, 22, 23, and 25). A ground water containment factor value of 10 is assigned for "evidence of hazardous substance migration from source area" (ref. 1, Table 3-2).

Release to Surface Water

The underground holding tank was not equipped with a maintained engineered cover and run-on control/runoff management system (ref. 12, p. 2-4). Therefore, a surface water containment factor value of 10 is assigned (ref. 1, Table 4-2).

2.4.1. Hazardous Substances

The underground holding tank was used for the storage of water from washdowns in the plating areas (ref. 12, p. 2-4). Based on industrial process literature and an interview with the Alark Hard Chrome owners, the chromium plating solution consisted of chromic acid and sulfuric acid, the cadmium plating solution consisted of cadmium complexed with cyanide, and the nickel plating solution consisted of nickel sulfate and nickel chloride (ref. 13, p. 5; ref. 15, p. 1).

The hazardous substances associated with the holding tank are:

- total chromium
- hexavalent chromium
- cadmium
- cyanide
- nickel

2.4.2 Hazardous Waste Quantity

Tier A: Hazardous Constituent Quantity

There is insufficient information to document the hazardous constituent quantity for the underground holding tank.

Hazardous Constituent Quantity Value: 0

Tier B: Hazardous Wastestream Quantity

There is insufficient information to document the hazardous wastestream quantity for the underground holding tank.

Hazardous Wastestream Quantity Value: 0

Tier C: Source Volume

The underground holding tank had a capacity of 500 gallons (ref. 12, p. 2-4). Converting capacity to volume yields 2.5 cubic yards (500 gallons divided by 200 gallons/cubic yard). After applying the Tier C divisor of 2.5 for tanks, the source volume value for Source 3 is 1 (ref. 1, Table 2-5).

Dimension of Source (yd^3): 2.5
Volume Assigned Value: 1

<u>Tier D: Source Area</u>

Since the volume of Source 3 has been determined, the area measure was not evaluated (ref. 1, Section 2.4.2.1.3).

Area of Source (ft^2): N/A
Area Assigned Value: 0

Source Hazardous Waste Quantity

Tier C, Source Volume, provides the source hazardous waste quantity value for Source 3.

Source Hazardous Waste Quantity: 1

SOURCE DESCRIPTION

2.2 Source Characterization

Source Description: Source 4 —Contaminated Soil

In 1982 and 1983, the Riverside County Department of Health collected soil samples from the front room of the building near the cadmium plating tank, from the middle room near the chromium and nickel plating tanks, from the middle room in the disposal pit, and from outside the back door. The samples were analyzed for chromium, cadmium, and nickel using atomic absorption spectrophotometry and x-ray fluorescence spectrometry. Analytical results indicated the presence of total chromium at a maximum concentration of 41,200 milligrams/kilogram (mg/kg) below the bottom of the disposal pit. Cadmium was detected at a maximum concentration of 4,480 mg/kg beside the cadmium plating tank, and nickel was detected at a maximum concentration of 14,000 mg/kg beside one of the nickel rinsing tanks (ref. 6, pp. 1 and 4; ref. 10, Appendix A, pp. A-2 through A-7).

In March 1983, a contractor to Alark Hard Chrome conducted a subsurface investigation to determine the extent of soil contamination at the site (ref. 7, p. 1, Exhibits 26 through 32). Representatives from the Riverside County Department of Health were present to collect split samples (ref. 7, p. 3). Fifteen (15) boreholes were drilled, with a majority being located in the middle room of the building (ref. 7, Figure 2). The boreholes were drilled to a depth of 40 feet or until refusal at contact with the underlying bedrock (ref. 4, p. 12; ref. 7, p. 3). One hundred twenty-one (121) soil samples were collected approximately every 3 feet and analyzed for total chromium, cadmium, and nickel (ref. 7, p. 1, Exhibits 26 through 32). Based on the analytical results obtained by Alark Hard Chrome's contractor, total chromium was detected at a maximum concentration of 4,550 mg/kg at a depth of 13 to 14 feet bgs in boring BH11, which was located in the middle room between one of the chromium tanks and the disposal pit (ref. 7, Figure 2, Exhibit 31). Cadmium and nickel were detected at maximum concentrations of 122 mg/kg and 132 mg/kg, respectively, at a depth of 9 to 10 feet bgs in boring BH2, which was located in the middle room near one of the chromium tanks (ref. 7, Figure 2, Exhibit 26). However, the analytical results from the Riverside County Department of Health split samples differed significantly in some cases from those obtained by Alark Hard Chrome's contractor (ref. 10, p. 11, Appendix A, p. A-10).

In August 1986, a contractor to Alark Hard Chrome excavated concrete flooring and soil in the vicinity of the chromium plating tanks and the disposal pit in the middle room. Approximately 400 cubic yards of soil were excavated to a depth of 10 to 12 feet bgs and stockpiled in the front room. Excavation activities were then halted by order of the DTSC. The DTSC directed the site owners to cease work until an acceptable work plan to perform a complete site characterization had been submitted and approved (ref. 8, p. 3, Figure 3; ref. 9, p. 2; ref. 11, p. 2). The DTSC approved the work plan in March 1990, and the site owners were scheduled to commence with field work in April 1990 (ref. 14, p. 9). However, Alark did not continue the investigation and the DTSC assumed responsibility for the field work (ref. 11, p. 1).

In July 1990 and March 1991, a contractor to the DTSC conducted subsurface soil investigations in the front room, middle room, grinding room, and outside the west side of the building (ref. 9, pp. 1 and 2; ref. 19, p. 1and 2). Prior to drilling, the 400 cubic yards of stockpiled soil in the front room were returned to the excavated area in the middle room (ref. 10, p. 13). Twenty-one (21) boreholes (B16 through B28 and B30 through B35) were drilled to depths ranging from 7.5 feet bgs to 51 feet bgs in July 1990 (ref. 10, Appendix B, pp. B-2 through B-22). Ninety-two (92) soil samples were collected every 5 or 10 feet (ref. 9, pp. 3, 4, and 5). Three additional boreholes (B36, B37, and B38) were drilled to depths of 10 feet bgs, 40 feet bgs, and 60 feet bgs, respectively, in March 1991 (ref. 10, Appendix B, pp. B-25, B-26, B-29, and

B-30). Eleven (11) samples were collected at depths ranging from 1 foot bgs to 40 feet bgs (ref. 19, p. 3). Figure 1 shows the locations of the 1990 and 1991 boreholes (ref. 9, p. 2, ref. 19, p. 2). All 103 samples were analyzed for total metals using EPA Method 6010. Of the 103 samples, 32 samples were also analyzed for hexavalent chromium using EPA Method 7197 and 10 samples were analyzed for total cyanide using EPA Method 9010 (ref. 9, pp. 3, 4, and 5; ref. 19, p. 3). Tables 1, 2, and 3 present the analytical results from the July 1990 and March 1991 DTSC soil sampling events (ref. 9, pp. 6 through 25; ref. 19, p 4).

As presented in Tables 1, 2, and 3, boreholes B26, B30, B31, B32, B33, and B35 are designated as “background,” since soil samples collected from these boreholes would most likely not have been influenced by Alark Hard Chrome electroplating operations. As shown in Figure 1, Source 1 (Plating Tank Spillage) was located in the southwest corner of the front room (cadmium plating, rinsing, and soaking tanks) and most of the middle room (chromium and nickel plating, rinsing, and soaking tanks), Source 2 (Disposal Pit) was located in the northeast corner of the middle room, and Source 3 (Underground Holding Tank) was located outside adjacent to the west side of the building (ref. 7, Figure 2 ref. 9, p. 2). In addition, grinding operations were conducted in the back room and “pools of chemicals” were observed in the loading area outside the back door (west end of the building) during the 1982 Riverside County Department of Health investigation (ref. 5 , p. 1). Background boreholes B26, B32, B33, and B35 are located in the front room, but not in the corner where the cadmium tanks were located. Background boreholes B30 and B31 are located outside to the north of the building (ref. 9, p. 2).

As shown in Tables 1, 2, and 3, total chromium, hexavalent chromium, cadmium, cyanide, and nickel were detected at concentrations significantly above background levels at comparable depths in soils in the vicinity Source 1, Source 2, Source 3, the grinding room, and near the backdoor (ref. 9, pp. 2 and 6 through 25; ref. 10, Appendix B, pp. B-1 through B-30; ref. 19, pp. 2 and 4).

From May through August 1994, a contractor to DTSC excavated 1,207.73 cubic yards of contaminated soil from a 26-foot wide by 30-foot long area in the middle room. Figure 1 shows the limits of this excavation (ref. 23, pp. 4 and 5, Attachment 5, p. 5-3). The excavation was accomplished by first removing the top 5 feet of soil from the entire middle room in order to allow movement of an auger drill rig beneath the roof of the building (ref. 23, Attachment 4, p. 4-38). One hundred one (101) closely spaced boreholes were then drilled in the 28-foot wide by 30-foot long area to depths of 27 to 40 feet bgs (i.e., to just above the top of the water table or refusal due to contact with bedrock) (ref. 23, p. 2, Attachment 4, p. 4-38, Attachment 5, pp. 5-4 through 5-6). The excavated soil was transported off site to the Kettleman Hills hazardous waste disposal facility (ref. 23, p. 5). The boreholes were filled with sand slurry cement to approximately 5 feet bgs, and the entire middle room was brought up to grade via a 2-foot layer of gravelly sand, followed by a 1-foot layer of clay, followed by another 2-foot layer of sand, and capped with a 4-inch concrete slab. A concrete slab was also poured outside the back door of the building (ref. 23, pp. 4 and 5).

At eight of these 101 borehole locations, a sample was collected from the bottom of the boring and analyzed for total metals using EPA Method 6010/7190 (ref. 23, Attachment 4, pp. 4-3 through 4-16, Attachment 5, pp. 5-4 through 5-6, Attachment 6, pp. 6-2, 6-6, 6-8, 6-10, 6-12, 6-14, and 6-16). At one of the 101 borehole locations, a sample was collected from the bottom of the boring and analyzed for hexavalent chromium using EPA Method 7196 (ref. 23, Attachment 4, p. 4-5, Attachment 5, p. 5-4, Attachment 6, p. 6-3). Table 4 presents the analytical results (ref. 23, Attachment 6, pp. 6-2 through 6-17).

Table 1
1990 and 1991 DTSC Soil Sample Results for Total and Hexavalent Chromium(mg/kg)
(*hexavalent chromium results in italics*) (significantly above background results underlined)

Borehole	Depth (ft bgs)									
	0	**1**	**5**	**10**	**13-15**	**20**	**25-30**	**40**	**45**	**50**
B26 (BG)	NS	NS	7.7	6.1	2.8	NS	NS	NS	NS	NS
B30 (BG)	NS	NS	8.1	2.1/2.3	NS	2.2	3.3	4.8	NS	2.6
B31 (BG)	NS	NS	10	12/10	NS	7.3	7.7	12	2.6	NS
B32 (BG)	NS	NS	11	11	NS	4.3	NS	NS	NS	NS
B33 (BG)	NS	NS	13	8.4/4.7	NS	5.0	NS	NS	NS	NS
B35 (BG)	NS	NS	9.2 *ND*	11/ 8.0 *ND/ND*	NS	8.2 *ND*	7.6 *ND*	7.7 *ND*	NS	NS
B34 (FR)	NS	NS	NS	8.6/7.5	NS	4.3	6.1	NS	NS	NS
B22 (MR)	NS	NS	**3,120**	21/27	NS	15	NS	NS	NS	NS
B23 (MR)	NS	NS	**1,560** ***290***	**3,830** ***160***	NS	**170/170** ***120/120***	**240** ***30***	NS	NS	NS
B24A (MR)	NS	NS	**2,310**	NS	NS	NS	NS	NS	NS	NS
B24B (MR)	NS	NS	30	**44**	NS	**210**	7.6	NS	NS	NS
B25 (MR)	NS	NS	**100** ***74***	16 ***13***	NS	**410** ***320***	**160** ***170***	NS	NS	NS
B27 (MR)	NS	NS	**3,460** ***330***	**3,430** ***120***	NS	**3,550/4,380** ***280/11***	**7,000** ***320***	**1,010** ***380***	NS	NS
B28 (MR)	NS	NS	**110** ***80***	**100/160** ***98/130***	NS	**210** ***180***	**220** ***220***	**93** ***1.6***	NS	NS
B36 (MR)	NS	1,200 *ND*	13	10	NS	NS	NS	NS	NS	NS
B37 (MR)	NS	1,400 *1,400*	NS	**1,500**	NS	**870** ***1,100***	**320**	**810** ***950***	NS	NS
B16A (GR)	NS	NS	**43**	**43**	**520**	NS	NS	NS	NS	NS
B19 (GR)	NS	NS	**800**	**26/25**	**46**	NS	NS	NS	NS	NS
B16 (OUT)	NS	NS	**48**	**100**	NS	**160**	9.0	1.7	NS	NS
B17 (OUT)	130	NS	12	14/16	NS	**120**	NS	NS	NS	NS
B18 (OUT)	96	NS	24	20/18	NS	2.9	NS	NS	NS	NS
B20 (OUT)	NS	NS	**2,500**	**230**	**20**	NS	NS	NS	NS	NS
B21 (OUT)	270	NS	38	**48**	NS	NS	NS	NS	NS	NS
B38 (OUT)	NS	300 *ND*	**510**	**58**	NS	NS	NS	NS	NS	NS

References: 9, pp. 2 and 6 through 25; 19, pp. 2 and 4
BG = Background
FR = Front Room adjacent to former cadmium rinsng tank
MR = Middle Room in vicinity of former nickel/chromium tanks and pit
GR = Grinding Room
not
OUT = Outside west side of building in vicinity of former underground holding tank and loading area
NS = Not sampled
ND = Analyte not found above detection limit. Detection limits provided in References 9 and 19.

Table 2
1990 and 1991 DTSC Soil Sample Results for Cadmium and Cyanide (mg/kg)
(cyanide results in italics) **(significantly above background results underlined)**

	Depth (ft bgs)									
Borehole	**0**	**1**	**5**	**10**	**13-15**	**20**	**25-30**	**40**	**45**	**50**
B26 (BG)	NS	NS	ND	ND	ND	NS	NS	NS	NS	NS
B30 (BG)	NS	NS	ND	ND/ND	NS	ND	ND	ND	NS	ND
B31 (BG)	NS	NS	ND	ND/ND	NS	0.4	0.3	ND	ND	NS
B32 (BG)	NS	NS	ND	ND	NS	ND	NS	NS	NS	NS
B33 (BG)	NS	NS	ND	ND/ND	NS	0.4	NS	NS	NS	NS
B35 (BG)	NS	NS	ND	ND/ND *ND*	NS	ND *ND*	ND	ND	NS	NS
B34 (FR)	NS	NS	NS	ND/ND ***30/28***	NS	ND ***4.9***	ND	NS	NS	NS
B22 (MR)	NS	NS	**32**	ND/ND	NS	**2.2**	NS	NS	NS	NS
B23 (MR)	NS	NS	**29**	**9.1**	NS	**22/21**	**20**	NS	NS	NS
B24A (MR)	NS	NS	**16**	NS	NS	NS	NS	NS	NS	NS
B24B (MR)	NS	NS	**0.3**	ND *ND*	NS	ND *ND*	ND	NS	NS	NS
B25 (MR)	NS	NS	ND	ND	NS	ND	ND	NS	NS	NS
B27 (MR)	NS	NS	**17**	**18** ***2***	NS	**20/16** ***2***/*ND*	**4.9**	**0.3**	NS	NS
B28 (MR)	NS	NS	ND	ND/ND	NS	ND	ND	ND	NS	NS
B36 (MR)	NS	4.9	ND	ND	NS	NS	NS	NS	NS	NS
B37 (MR)	NS	92	NS	**67**	NS	0.4	ND	ND	NS	NS
B16A (GR)	NS	NS	ND	**0.3**	ND	NS	NS	NS	NS	NS
B19 (GR)	NS	NS	**100**	ND/ND	**0.8**	NS	NS	NS	NS	NS
B16 (OUT)	NS	NS	ND	ND	NS	ND	ND	ND	NS	NS
B17 (OUT)	12	NS	ND	**0.3/0.4**	NS	1.0	NS	NS	NS	NS
B18 (OUT)	1.7	NS	ND	ND/ND	NS	ND	NS	NS	NS	NS
B20 (OUT)	NS	NS	ND	ND	ND	NS	NS	NS	NS	NS
B21 (OUT)	2.7	NS	ND	ND	NS	NS	NS	NS	NS	NS
B38 (OUT)	NS	87	**14**	**19**	NS	NS	NS	NS	NS	NS

References: 9, pp. 2 and 6 through 25; 19, pp. 2 and 4
BG = Background
FR = Front Room adjacent to former cadmium rinsng tank
MR = Middle Room in vicinity of former nickel/chromium tanks and pit
GR = Grinding Room
not
OUT = Outside west side of building in vicinity of former underground holding tank and loading area
NS = Not sampled
ND = Analyte not found above detection limit. Detection limits provided in References 9 and 19.

Table 3
1990 and 1991 DTSC Soil Sample Results for Nickel (mg/kg)
(significantly above background results underlined)

Borehole	**Depth (ft bgs)**									
	0	**1**	**5**	**10**	**13-15**	**20**	**25-30**	**40**	**45**	**50**
B26 (BG)	NS	NS	7	5	2	NS	NS	NS	NS	NS
B30 (BG)	NS	NS	7	ND/ND	NS	2	5	7	NS	2
B31 (BG)	NS	NS	8	9/8	NS	7	6	9	2	NS
B32 (BG)	NS	NS	10	9	NS	4	NS	NS	NS	NS
B33 (BG)	NS	NS	10	7/3	NS	11	NS	NS	NS	NS
B35 (BG)	NS	NS	7	12/7	NS	5	8	6	NS	NS
B34 (FR-)	NS	NS	NS	7/7	NS	3	2	NS	NS	NS
B22 (MR-)	NS	NS	**120**	6/7	NS	6	NS	NS	NS	NS
B23 (MR)	NS	NS	22	**63**	NS	23	**25**	NS	NS	NS
B24A (MR)	NS	NS	16	NS	NS	NS	NS	NS	NS	NS
B24B (MR)	NS	NS	11	6	NS	3	3	NS	NS	NS
B25 (MR)	NS	NS	8	4	NS	6	4	NS	NS	NS
B27 (MR)	NS	NS	16	17	NS	21/8	9	15	NS	NS
B28 (MR)	NS	NS	10	4/7	NS	5	5	13	NS	NS
B36 (MR)	NS	19	10	7	NS	NS	NS	NS	NS	NS
B37 (MR)	NS	47	NS	**49**	NS	9	6	10	NS	NS
B16A (GR)	NS	NS	10	9	**16**	NS	NS	NS	NS	NS
B19 (GR)	NS	NS	15	11/11	**19**	NS	NS	NS	NS	NS
B16 (OUT)	NS	NS	13	8	NS	6	4	ND	NS	NS
B17 (OUT)	24	NS	8	8/9	NS	7	NS	NS	NS	NS
B18 (OUT)	14	NS	7	6/7	NS	ND	NS	NS	NS	NS
B20 (OUT)	NS	NS	**47**	12	**7**	NS	NS	NS	NS	NS
B21 (OUT)	9	NS	8	7	NS	NS	NS	NS	NS	NS
B38 (OUT)	NS	140	**54**	**310**	NS	NS	NS	NS	NS	NS

References: 9, pp. 2 and 6 through 25; 19, pp. 2 and 4
BG = Background
FR = Front Room adjacent to former cadmium rinsng tank
MR = Middle Room in vicinity of former nickel/chromium tanks and pit
GR = Grinding Room
not

OUT = Outside west side of building in vicinity of former underground holding tank and loading area
NS = Not sampled
ND = Analyte not found above detection limit. Detection limits provided in References 9 and 19.

Table 4
1994 DTSC Soil Sample Results (mg/kg)

Borehole	Sample Depth (feet bgs)	Total Chromium	Hexavalent Chromium	Cadmium	Nickel	References
1	40	2,810	NA	5.02	18.1	23, p. 6-2
2	40	NA	2,450	NA	NA	23, p. 6-3
12	40	1,050	NA	NA	NA	23, p.6-6
25	39	222	NA	NA	NA	23, p. 6-8
33	40	45.9	NA	NA	NA	23, p. 6-8
47	40	226	NA	NA	NA	23, p. 6-10
58	40	572	NA	NA	NA	23, p. 6-12
76	40	291	NA	NA	NA	23, p. 6-14
100	37	79.2	NA	NA	NA	23, p. 6-16

NA = Not analyzed

Results of the 1990, 1991, and 1994 soil sampling events (see Figure 1 and Tables 1, 2, 3, and 4) indicate that contaminated soil is still present on site at a depth of at least 40 feet bgs beneath the 26-foot wide by 30-foot long excavated area in the middle room, at depths between 5 feet bgs and at least 40 feet bgs in the remainder of the middle room, at depths between 10 feet bgs and 20 feet bgs in the front room where the cadmium tanks were located, at depths between 5 feet bgs and 15 feet bgs in the grinding room, at depths between 5 feet bgs and 20 feet bgs outside the building in the loading area, and at depths between 5 feet bgs and 20 feet bgs outside the building where the underground holding tank was located (ref. 9, pp. 2 and 6 through 25; ref. 19, pp. 2 and 4; ref. 23, Attachment 5, p. 5-3, Attachment 6, pp. 6-2 through 6-17).

Source Type

The source type for Source 4 is "contaminated soil" (ref. 1, Table 2-5).

Source Location

Based on the 1990, 1991, and 1994 soil sampling results (see Figure 1 and Tables 1, 2, 3, and 4), contaminated soil was or is located in all three rooms of the on-site building, outside the building in the loading area, and outside the building in the vicinity of the former underground holding tank. Tables 1, 2, 3, and 4 present the soil sampling results. Figure 1 shows the locations of the borings (ref. 9, pp. 2 and 6 through 25; ref. 19, pp. 2 and 4; ref. 23, Attachment 5, p. 5-3, Attachment 6, pp. 6-2 through 6-17).

Source Containment

Gas Release to Air

The hazardous substances associated with Source 4 are total chromium, hexavalent chromium, cadmium, cyanide, and nickel (ref. 9, pp. 2 and 6 through 25; ref. 19, pp. 2 and 4; ref. 23, Attachment 5, p. 5-3, Attachment 6, pp. 6-2 through 6-17). Total chromium, hexavalent chromium, cadmium, cyanide, and nickel are not gaseous hazardous substances (ref. 2, pp. B-4, B-5, B-6, and B-14). Gas potential to release can only be evaluated for those sources that contain gaseous hazardous substances (ref. 1, Section 6.1.2.1).

Particulate Release to Air

All areas of contaminated soil at the site have been covered with concrete, except a small area at the rear of the building where the underground holding tank was located (ref. 8, p. 6, Attachment A, p. A-4; ref. 9, pp. 2 and 6). During the 1990 DTSC subsurface soil investigation, Borehole B16 was drilled adjacent to the underground holding tank (ref. 9, p. 2). As shown in Table 1, soil samples were not collected from this borehole at depths less than 5 feet bgs (ref. 9, p.3). Since contaminated soil in the vicinity of the underground holding tank is not surrounded by an engineered windbreak, not covered with an essentially impermeable cover, not enclosed in a building, and there is no documentation to support the presence of an uncontaminated soil cover; the particulate containment factor is assigned a value of 10 for "all situations except those specifically listed below" (ref. 1, Tables 6-9).

Release to Ground Water

Contaminated soil is present in situ to a depth of at least 40 feet bgs (ref. 23, Attachment 5, p. 5-3, Attachment 6, pp. 6-2 through 6-17). A ground water containment factor value of 10 is assigned for "no liner" (ref. 1, Table 3-2).

Release to Surface Water

When the electroplating shop was in operation, contaminated soils located outside of the building (i.e., in the vicinity of the loading area and underground holding tank) were not equipped with a maintained engineered cover and run-on control/runoff mangement system (ref. 7, p. 6, Figure 2). Therefore, a surface water containment factor value of 10 is assigned (ref. 1, Table 4-2).

2.4.1. Hazardous Substances

As shown in Tables 1, 2, 3, and 4, total chromium, hexavalent chromium, cadmium, cyanide, and nickel have been detected in on-site soils at concentrations significantly above background levels (ref. 9, pp. 2 and 6 through 25; ref. 19, pp. 2 and 4; ref. 23, Attachment 5, p. 5-3, Attachment 6, pp. 6-2 through 6-17).

Hazardous substances associated with Source 4 are:

- total chromium
- hexavalent chromium
- cadmium
- cyanide
- nickel

2.4.2 Hazardous Waste Quantity

Tier A: Hazardous Constituent Quantity

There is insufficient information to document the hazardous constituent quantity for the contaminated soil.

Hazardous Constituent Quantity Value: 0

Tier B: Hazardous Wastestream Quantity

There is insufficient information to document the hazardous wastestream quantity for the contaminated soil.

Hazardous Wastestream Quantity Value: 0

Tier C: Volume

Based on the analytical results of the 1990 and 1991 DTSC soil sampling events, there are sufficient data to delineate two volumes of contaminated soil at the Alark Hard Chrome site. Additional contaminated soil exists, but not in volumes readily quantifiable. The two readily quantifiable volumes for Source 4 are presented below.

Volume A

As shown in Figure 2, Volume A is associated with the middle room. As presented in Table 1, results of the 1990 and 1991 DTSC soil sampling events indicated the presence of total chromium at concentrations significantly above background levels in soil samples collected from 5 feet bgs to 30 feet bgs in borings B23, B25, B27, and B28 (ref. 9, pp. 2, 14, 16, 18, and 19). The area defined by these borings is shown in Figure 2. When a graph paper overlay with a scale of 20 squares per inch is placed over this area, 387 squares fall within the boundaries defined by borings B23, B25, B27, and B28. Since the scale of Figure 2 is 21 feet per inch, each square on the graph paper represents approximately 1.1 square feet of this area (21 feet per inch divided by 20 squares per inch equals 1.05 linear feet per square which, when squared, equals 1.1 square feet per square). Therefore, the area defined by borings B23, B25, B27, and B28 is approximately 426 square feet (1.1 square feet per square multiplied by 387 squares). The volume of Volume A is 10,650 cubic feet (426 square feet multiplied by 25 feet thick) or 394 cubic yards (10,650 cubic feet divided by 27 cubic feet per cubic yard).

Volume B

As shown in Figure 2, Volume B is associated with the grinding room, underground holding tank, and loading area. As presented in Table 1, results of the 1990 and 1991 DTSC soil sampling events indicated the presence of total chromium at concentrations significantly above background levels in soil samples collected from 5 feet bgs to 10 feet bgs in borings B16, B16A, B19, B38, and B20 (ref. 9, pp. 2, 6, 7, 10, and 11; ref. 19, pp. 2 and 4). The area defined by these borings is shown in Figure 2. When a graph paper overlay with a scale of 20 squares per inch is placed over this area, 279 squares fall within the boundaries defined by borings B16, B16A, B19, B38, and B20. Since the scale of Figure 2 is 21 feet per inch, each square on the graph paper represents approximately 1.1 square feet of this area (21 feet per inch divided by 20 squares per inch equals 1.05 linear feet per square which, when squared, equals 1.1 square feet per square). Therefore, the area defined by borings B16, B16A, B19, B38, and B20 is approximately 307 square feet (1.1 square feet per square multiplied by 279 squares). The volume of Volume B is 1,535 cubic feet (307 square feet multiplied by 5 feet thick) or 57 cubic yards (1,535 cubic feet divided by 27 cubic feet per cubic yard).

The total volume for Volumes A and B is 451 cubic yards (394 cubic yards + 57 cubic yards). After applying the Tier C divisor of 2,500 for contaminated soil, the source volume value for Source 4 is 0.18 (ref. 1, Table 2-5)

Dimensions of Source (yd^3): 451
Volume Assigned Value: 0.18

A copy of Figure 2 is available at the EPA Headquarters Superfund Docket:

U.S. CERCLA Docket Office
Crystal Gateway #1, 1st Floor
1235 Jefferson Davis Highway
Arlington, VA 22202

Telephone: (703) 603-8917
E-Mail: superfund.docket@epa.gov

Tier D: Source Area

Since a value greater than 0 has been determined for Tier C, the area measure was not evaluated for Source 4 (ref. 1, Section 2.4.2.1.3).

Area of Source (ft^2): 0
Area Assigned Value: 0

Source Hazardous Waste Quantity

Tier C, Source Volume, provides the highest source hazardous waste quantity value for Source 4.

Source Hazardous Waste Quantity: 0.18

SUMMARY OF SOURCE DESCRIPTIONS

Source Number	Source Hazardous Waste Quantity Value	Ground Water Containment	Surface Water Containment	Air Gas/Particulate Containment
1	>0	10	10	0
2	7.6	10	10	0
3	1	10	10	0
4	0.18	10	10	10

Other Possible Sources

There are other possible sources at the Alark Hard Chrome site, including the grinders; however, there is insufficient information in the files to include them in the documentation record.

GROUND WATER MIGRATION PATHWAY

3.0.1 General Considerations

The Alark Hard Chrome site is located in the Riverside hydrogeologic basin. This basin consists of alluvial deposits overlying a faulted and fractured granitic basement complex (ref. 10, p. 38; ref. 24; ref. 25).

Stratum 1: Alluvial Deposits

The alluvial deposits are composed of unconsolidated gravel, sand, silt, and clay (ref. 10, pp. 7 and 58). There are no known continuous clay layers between ground surface and the depth from which water supplies are drawn. This is supported by the fact that agricultural chemicals, such as nitrates, have been detected in municipal drinking water wells screened in this stratum (ref. 24). Regionally, the alluvial deposits range in thickness from less than 15 feet to greater than 1,500 feet (ref. 10, Figure 4-4). The water table occurs at depths ranging from less than 5 feet bgs at Lake Evans, which is located approximately 0.5 mile northwest of the Alark Hard Chrome site, to more than 100 feet bgs elsewhere in the basin (ref. 25). The alluvial deposits are considered an aquifer for HRS purposes because they are currently used as a source of drinking water (ref. 17, Attachment A, p. A-2; ref. 21; ref. 22, p. 1).

Five monitoring wells in the vicinity of the Alark Hard Chrome site are screened in the alluvial deposits (MW-1, MW-4, MW-5, MW-6, and MW-10) (ref. 10, Appendix B, pp. B-23 and B-24, Appendix D, pp. D-2 through D-8, D-17, and D-18). The locations of these wells are shown in Figure 3 (ref. 10, Figure 3-1). The following water level measurements were collected in December 1995 from the four wells that are located to the north and northeast of the former electroplating shop: 45.53 feet bgs (MW-1), 45.20 feet bgs(MW-4), 46.54 feet bgs (MW-5), and 45.06 feet bgs (MW-6). Depth to ground water in well MW-10, which is located approximately 250 feet northwest of the shop, was 53.96 feet bgs in December 1995 (ref. 10, Figure 3-1, Table 4-1). There are insufficient data to establish a flow gradient (ref. 10, pp. 40 and 41).

Stratum 2: Fractured Bedrock

Surface exposures of the granitic basement complex form two hills approximately 0.25 mile northwest of the Alark Hard Chrome site. These hills have steeply dipping north-facing slopes that represent a northwest-southeast trending fault trace, with fractures running parallel to the strike (ref. 10, pp. 38 and 40, Figure 4-4). Drilling and seismic refraction data indicate that the granitic basement complex beneath the Alark Hard Chorme site exhibits fault trace and fracture characteristics similar to those of the hills (ref. 10, p. 40). This buried northwest-southeast trending fault has contributed to an irregular granitic bedrock surface that ranges in depth from 13 feet bgs approximately 150 feet west of the on-site building to 60 feet bgs approximately 20 feet northeast of the building (ref. 10, p. 40, Figures 4-1 and 4-2, Appendix B. p. B-24; Appendix D, p. D-22).

Five ground water monitoring wells in the vicinity of the Alark Hard Chrome site are screened in the factured bedrock (MW-2, MW-3, MW-7, MW-8, and MW-9) (ref. 10, Appendix B, pp. B-25 through B-28, Appendix D, pp. D-9 through D-16). The locations of these wells are shown in Figure 3 (ref. 10, Figure 3-1). Hazardous substances associated with the Alark Hard Chrome site (i.e., total chromium and hexavalent chromium) have been detected at elevated concentrations in wells MW-2, MW-7, and MW-9 (ref. 10, p. 50, Table 4-5). However, the fractured bedrock is not considered an aquifer for HRS purposes because flow rates measured in the five bedrock monitoring wells indicate that this stratum does not yield economically significant quantities of water. The wells were pumped dry while purging at flow rates of less than 0.5 gallons per minute (ref. 10, p. 45).

A copy of Figure 3 is available at the EPA Headquarters Superfund Docket:

U.S. CERCLA Docket Office
Crystal Gateway #1, 1st Floor
1235 Jefferson Davis Highway
Arlington, VA 22202

Telephone: (703) 603-8917
E-Mail: superfund.docket@epa.gov

3.1 Likelihood of Release

3.1.1 Observed Release

<u>Aquifer Being Evaluated: Alluvial Deposits</u>

<u>Chemical Analysis</u>

An observed release by chemical analysis can be documented using 1995 DTSC ground water sampling data that indicate that total chromium and hexavalent chromium concentrations have increased significantly above background levels in the alluvial deposits immediately to the northeast of the middle room of the former Alark Hard Chrome electroplating shop.

In December 1995, a contractor to the DTSC sampled the five ground water monitoring wells in the vicinity of the site that are screened in the alluvial deposits (i.e., MW-1, MW-4, MW-5, MW-6, and MW-10). Figure 3 shows the locations of these wells (ref. 10, Figure 3-1). Table 5 presents the screening intervals and analytical results. The samples were analyzed for total chromium using EPA Method 6010 and hexavalent chromium using EPA Method 7196 (ref. 10, Appendix B, pp. B-23 and B-24, Appendix D, pp. D-2 through D-8, D-17, and D-18, Appendix F, pp. F-50, F-52, F-58, F-60, and F-61). All quality assurance/quality control (QA/QC) requirements were met for the five samples (ref. 10, Appendix F, pp. F-2, F-49, F-51, F-53, F-57, F-59, and F-62).

As presented in Table 5, monitoring wells MW-5, MW-6, and MW-10 are designated as background wells. Analytical results from the December 1995 ground water sampling event indicate that the concentrations of total chromium and hexavalent chromium in these wells are representative of naturally occurring conditions (i.e., either not detected or, when detected, detected at the sample quantitation limit of 0.02 mg/l) (ref. 10, Appendix F, pp. F-50, F-52, F-58, F-60, and F-61). As shown in Figure 3, wells MW-5 and MW-6 are located approximately 80 feet northeast and north of the former electroplating shop, and well MW-10 is located approximately 250 feet northwest of the shop (ref. 10, Figure 3-1).

Monitoring wells MW-1 and MW-4 are located approximately 20 feet northeast of the middle room of the former electroplating shop (ref. 10, Figure 3-1). As presented in Table 5, total chromium was detected in these wells at concentrations greater than three times the maximum background concentration of 0.02 mg/l. Hexavalent chromium was detected in wells MW-1 and MW-4, and not detected in the background wells.

Table 5
1995 DTSC Ground Water Sampling Results Documenting an Observed Release

Monitoring Well ID	Screened Interval (feet bgs)	Sampling Date	Total Chromium (mg/L)	Detection Limit (mg/L)	Hexavalent Chromium (mg/L)	Detection Limit (mg/L)	References
Background Wells							
MW-5	42-58 (alluvium)	12/20/95	0.02	0.015	<0.02	0.02	10, pp. F-58 & 61
MW-6	39-54 (alluvium)	12/20/95	<0.015	0.015	<0.02	0.02	10, pp. F-58 & 60
MW-10	58-78 (alluvium)	12/19/95	0.02	0.015	<0.02	0.02	10, pp. F-50 & 52
Contaminated Wells							
MW-1	44-59 (alluvium)	12/20/95	0.21	0.015	0.27	0.02	10, pp. F-58 & 61
MW-4	40-55 (alluvium)	12/20/95	0.08	0.015	0.10	0.02	10, pp. F-58 & 60

< = Analyte not found above reported detection limit

Attribution

Total chromium and hexavalent chromium have been detected at elevated concentrations in soils beneath the northeastern portion of electroplating shop's middle room at depths within 6 feet of reported water levels in monitoring wells MW-1 and MW-4. In 1990 and 1994, contractors to DTSC drilled and sampled six boreholes (B1, B2, B27, B28, B47, and B58) near the northeast wall inside the middle room. The locations of these boreholes are shown in Figure 1 (ref. 9, p. 2; ref. 23, Attachment 5, p. 5-3). As shown in Tables 1 and 4, total chromium was detected in soil samples collected from a depth of 40 feet bgs in these boreholes at concentrations ranging from 93 mg/kg to 2,810 mg/kg. Hexavalent chromium was detected at concentrations ranging from 1.6 mg/kg to 2,450 mg/kg (ref. 9, pp. 18, and 19; ref. 23, pp. 6-2, 6-3, 6-10, and 6-12). As shown in Figure 3, monitoring wells MW-1 and MW-4 are located approximately 20 feet northeast of the middle room (ref. 10, Figure 3-1). In 1995, water levels in these two wells were measured at 45.53 feet bgs and 45.20 feet bgs, respectively (ref. 10, Table 4-1). The middle room of the electroplating shop housed the chromium plating tanks during Alark Hard Chrome's 15 years of operation (ref. 11, p. 2; ref. 7, Figure 2)

The Alark Hard Chrome site is located in a light industrial area. As shown in Figure 3, KH Metals and Supply (formerly Klure and Harris, Incorporated) borders the Alark Hard Chrome property to the west, north, and northeast. Precision Auto Body and Paint is located to the south (ref. 10, p. 3, Figure 3-1). It is unlikely that either of these businesses is a contributor to the hexavalent chromium contamination in monitoring wells MW-1 and MW-4. KH Metals and Supply sells metal construction materials. Operations are limited to sales and some cutting of materials to size, per customer specifications (ref. 30). It is not known whether chromium-based paint is used, or has been used, in painting operations at Precision Auto Body and Paint. However, even if this were the case, chromium compounds used as pigments (e.g., lead chromate and zinc chromate) are insoluble to slightly soluble in water and, therefore, not likely to be contributing to chromium contamination in ground water (ref. 28, pp. 430, 431, 436, and 437; ref. 29, pp. 975, 2228, 5275, and 10026).

Ground Water Observed Release Factor Value: 550

3.2 Waste Characteristics

3.2.1 Toxicity/Mobility

Hazardous Substance	Source	Toxicity	Mobility	Toxicity/Mobility Factor Value	Reference
total chromium	1,2,3,4	10,000	1*	10,000	2, p. B-5
hexavalent chromium	1,2,3,4	10,000	1*	10,000	2, p. B-5
cadmium	1,2,3,4	10,000	0.01	100	2, p. B-4
cyanide	1,2,3,4	100	1	100	2, p. B-6
nickel	1,2,3,4	10,000	0.01	100	2, p. B-14

* Total chromium and hexavalent chromium were assigned the maximum mobility value of 1, because these two hazardous substances meet the criteria for an observed release by chemical analysis to the aquifer underlying the sources at the site (ref. 1, Section 2.3.1.2). See Section 3.1.1 (Observed Release) for documentation of the presence of total chromium and hexavalent chromium in the observed release to ground water at the Alark Hard Chrome site.

The toxicity/mobility factor value assigned for the ground water pathway is 10,000 (ref. 1, Section 3.2.1.3).

3.2.2 Hazardous Waste Quantity

The hazardous waste quantity assigned from Sections 2.4.2 for Sources 1, 2, 3, and 4 is 8.78 (>0 + 7.6 + 1 + 0.18). The hazardous waste quantity factor value assigned for the ground water pathway is 10 (ref. 1, Table 2-6, Section 2.4.2.2).

3.2.3 Waste Characteristics Factor Category Value

Multiplying the toxicity/mobility factor value of 10,000 by the hazardous waste quantity factor value of 10 produces 1×10^5, which yields a waste characteristics factor category value of 18 for the ground water pathway (ref. 1, Table 2-7).

Waste Characteristics Factor Category Value: 18

3.3 Targets

The following three water companies operate 18 drinking water wells within 4 miles of the Alark Hard Chrome site: City of Riverside Public Utilities Department (PUD), Riverside Highland Water Company, and Rubidoux Community Services District.

City of Riverside PUD

The City of Riverside PUD operates a blended drinking water supply system that serves approximately 200,000 people (ref. 17, p. 1). The system consists of 51 active drinking water wells. Forty-one (41) of these wells draw from the Bunker Hill ground water basin and the remaining 10 wells draw from the Riverside groundwater basin (ref. 17, Attachment A, pp. A-1 through A-3). The Bunker Hill basin (a.k.a., San Bernardino basin) is located approximately 9 miles north of the city of Riverside and is physically separated from the Riverside basin by faulting. Ground water drawn from the Bunker Hill basin is delivered to the City of Riverside PUD drinking water system via two pipelines (i.e., Gage System and Waterman System) (ref. 20).

As shown in Table 6, the total design capacity of the City of Riverside PUD drinking water system is 101,170 gallons per minute (gpm) The sum of the design capacities of the 16 Bunker Hill basin drinking water wells that feed into the Gage System is 41,150 gpm, which represents 41 percent of the total design capacity of the City of Riverside PUD system. The sum of the design capacities of the 25 Bunker Hill basin drinking water wells that feed into the Waterman System is 35,420 gpm, which represents 35 percent of the total design capacity of the City of Riverside PUD system. The remaining 24 percent of the City of Riverside PUD drinking water comes from the 10 Riverside basin drinking water wells (ref. 17, Attachment A, pp. A-1 through A-3).

All 10 Riverside basin drinking water wells are within 4 miles of the Alark Hard Chrome site. Six are located between 1 and 2 miles of the site, one is located between 2 and 3 miles of the site, and three are located between 3 and 4 miles of the site (ref. 17, Attachment B).

Riverside Highland Water Company

The Riverside Highland Water Company operates a blended drinking water supply system that serves approximately 16,500 people. The system consists of seven active drinking water wells. Three of these wells draw from the Lytle Creek ground water basin and the remaining four wells draw from the Riverside ground water basin. The Lytle Creek basin is separated from the Riverside basin by faulting. In 1997, the three Lytle Creek basin wells contributed 70 percent of Riverside Highland Water Company drinking water, and the four Riverside basin drinking water wells contributed the remaining 30 percent. The four Riverside basin wells have similar pumpage rates. One of these wells is located between 2 and 3 miles of the site; the other three are more than 4 miles from the site (ref. 21).

Rubidoux Community Services District

The Rubidoux Community Services District operates a blended drinking water supply system that serves approximately 22,000 people. The system consists of seven active wells that draw from the Riverside ground water basin and contribute 100 percent of the drinking water. No one well contributes greater than 40 percent to the system. Five of the wells are located between 1 and 2 miles of the site and the remaining two wells are located between 2 and 3 miles of the site (ref. 22, p. 1 and Attachment A).

Table 7 and Figure 4 present the drinking water wells within 4 miles of the Alark Hard Chrome site and the distances of these wells from the site (ref. 17, Attachment B; ref. 21; ref. 22, p. 1, Attachment A).

Table 6
Design Capacities of City of Riverside PUD Drinking Water Wells

Well ID	Basin	Design Capacity (gpm)	Reference
Gage 21-1	Bunker Hill - Gage System	1,700	17, p.A-1
Gage 26-1	Bunker Hill - Gage System	2,300	17, p.A-1
Gage 27-1	Bunker Hill - Gage System	2,300	17, p.A-1
Gage 27-2	Bunker Hill - Gage System	2,300	17, p.A-1
Gage 29-1	Bunker Hill - Gage System	2,300	17, p.A-1
Gage 29-2	Bunker Hill - Gage System	3,500	17, p.A-1
Gage 29-3	Bunker Hill - Gage System	3,600	17, p.A-1
Gage 30-1	Bunker Hill - Gage System	1,600	17, p.A-1
Gage 31-1	Bunker Hill - Gage System	2,000	17, p.A-1
Gage 46-1	Bunker Hill - Gage System	3,000	17, p.A-1
Gage 51-1	Bunker Hill - Gage System	1,650	17, p.A-1
Gage 56-1	Bunker Hill - Gage System	2,700	17, p.A-1
Gage 66-1	Bunker Hill - Gage System	3,200	17, p.A-1
Gage 92-1	Bunker Hill - Gage System	3,000	17, p.A-1
Gage 92-2	Bunker Hill - Gage System	3,000	17, p.A-1
Gage 92-3	Bunker Hill - Gage System	3,000	17, p.A-1
		Subtotal: 41,150	
Cooley H	Bunker Hill -Waterman System	1,200	17, p. A-1
Cooley I	Bunker Hill -Waterman System	1,900	17, p. A-1
Garner #1	Bunker Hill -Waterman System	700	17, p. A-1
Garner #2	Bunker Hill -Waterman System	700	17, p. A-1
Garner #4	Bunker Hill -Waterman System	900	17, p. A-1
Garner #5	Bunker Hill -Waterman System	1,550	17, p. A-1
Garner #6	Bunker Hill -Waterman System	3,500	17, p. A-1
Garner #7	Bunker Hill -Waterman System	3,000	17, p. A-1
Hunt #6	Bunker Hill -Waterman System	600	17, p. A-1
Hunt #10	Bunker Hill -Waterman System	900	17, p. A-1
Hunt #11	Bunker Hill -Waterman System	800	17, p. A-1
Meeks and Daley 59	Bunker Hill -Waterman System	unknown	17, p. A-1
Raub #2	Bunker Hill -Waterman System	unknown	17, p. A-1
Raub #3	Bunker Hill -Waterman System	700	17, p. A-1
Raub #4	Bunker Hill -Waterman System	1,600	17, p. A-1

Table 6
Design Capacities of City of Riverside PUD Drinking Water Wells

Well ID	Basin	Design Capacity (gpm)	Reference
Raub #5	Bunker Hill -Waterman System	2,750	17, p. A-1
Raub #6	Bunker Hill -Waterman System	2,900	17, p. A-1
Raub #8	Bunker Hill -Waterman System	3,000	17, p. A-1
Scheuer	Bunker Hill -Waterman System	600	17, p. A-1
Stiles	Bunker Hill -Waterman System	1,300	17, p. A-1
Thorne #12	Bunker Hill -Waterman System	1,700	17, p. A-2
Warren #1	Bunker Hill -Waterman System	1,540	17, p. A-2
Warren #2	Bunker Hill -Waterman System	1,000	17, p. A-2
Warren #3	Bunker Hill -Waterman System	580	17, p. A-2
Warren #4	Bunker Hill -Waterman System	2,000	17, p. A-2
		Subtotal: 35,420	
Garner B	Riverside South	3,000	17, p. A-2
Garner C	Riverside South	2,500	17, p. A-2
Garner D	Riverside South	2,500	17, p. A-2
Moore-Griffith	Riverside South	1,600	17, p. A-2
Twin Springs	Riverside South	3,100	17, p. A-3
Russell B	Riverside South	2,100	17, p. A-3
Electric Ave.	Riverside South	3,000	17, p. A-2
Van Buren #1	Riverside North	2,500	17, p. A-2
Van Buren #2	Riverside North	2,500	17, p. A-2
Gage DeBerry	Riverside North	1,800	17, p. A-2
		Subtotal: 24,600	
		TOTAL: 101,170	

Table 7
Distances of Drinking Water Wells From Alark Hard Chrome

Water Company	Well ID	Distance From Alark	Reference
City of Riverside PUD	Garner B	1.85	17, Attachment B
	Garner C	1.90	17, Attachment B
	Garner D	1.90	17, Attachment B
	Moore-Griffith	1.15	17, Attachment B
	Twin Springs	1.55	17, Attachment B
	Russell B	1.95	17, Attachment B
	Electric Ave.	2.05	17, Attachment B
	Van Buren #1	3.25	17, Attachment B
	Van Buren #2	3.40	17, Attachment B
	Gage DeBerry	3.70	17, Attachment B
Riverside Highland Water Company	RN7	2.85	21
Rubidoux Community Services District	No. 1	1.5	22, p. 1 and Attachment A
	No.5	1.60	22, p. 1 and Attachment A
	No. 8	1.65	22, p. 1 and Attachment A
	No.4	1.85	22, p. 1 and Attachment A
	No. 6	1.85	22, p. 1 and Attachment A
	No. 2	2.15	22, p. 1 and Attachment A
	No. 14	2.95	22, p. 1 and Attachment A

A copy of Figure 4 is available at the EPA Headquarters Superfund Docket:

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1235 Jefferson Davis Highway
Arlington, VA 22202

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3.3.1 Nearest Well

None of the drinking water wells within 4 miles of the Alark Hard Chrome site is subject to Level I or Level II concentrations (ref. 20, p. 1; ref. 21; ref. 22, p. 1). As presented in Table 7 and shown in Figure 4, the nearest drinking water well is the City of Riverside PUD Moore-Griffith well, which is located 1.15 miles northeast of the site (ref. 17, Attachment B). The nearest well factor is assigned a value of 5 (ref. 1, Table 3-11).

Nearest Well Factor Value: 5

3.3.2 Population

3.3.2.2 Level I Concentrations

No drinking water wells within 4 miles of the Alark Hard Chrome site are subject to actual contamination from the site (ref. 20, p. 1; ref. 21; ref. 22, p. 1). Therefore, the Level I concentrations factor is assigned a value of 0 (ref. 1, Section 3.3.2.2).

3.3.2.3 Level II Concentrations

No wells within 4 miles of the Alark Hard Chrome site are subject to actual contamination from the site (ref. 20, p. 1; ref. 21; ref. 22, p. 1). Therefore, the Level II concentrations factor is assigned a value of 0 (ref. 1, Section 3.3.2.3).

3.3.2.4 Potential Contamination

Based on the information provided above in Section 3.3 (Targets), the population served by each drinking water well within 4 miles of the Alark Hard Chrome site is apportioned as follows:

<u>City of Riverside PUD</u>

Design capacity of entire system = 101,170 gpm;
Population served by entire system = 200,000;
See Table 8 for apportioned population served by each of the 10 Riverside basin wells (ref. 17).

Table 8
Population Apportionment Calculations for City of Riverside PUD Riverside Basin Wells

Well ID	Design Capacity (gpm)	Percent Contribution to Entire System (%)	Apportioned Population Served By Each Well	Ref.
Garner B	3,000	3,000/101,170x100 = 3.0	.030 x 200,000 = 6,000	17
Garner C	2,500	2,500/101,170x100 = 2.5	.025 x 200,000 = 5,000	17
Garner D	2,500	2,500/101,170x100 = 2.5	.025 x 200,000 = 5,000	17
Moore-Griffith	1,600	1,600/101,170x100 = 1.6	.016 x 200,000 = 3,200	17
Twin Springs	3,100	3,100/101,170x100 = 3.1	.031 x 200,000 = 6,200	17
Russell B	2,100	2,100/101,170x100 = 2.1	.021 x 200,000 = 4,200	17
Electric Ave.	3,000	3,000/101,170x100 = 3.0	.030 x 200,000 = 6,000	17
Van Buren #1	2,500	2,500/101,170x100 = 2.5	.025 x 200,000 = 5,000	17
Van Buren #2	2,500	2,500/101,170x100 = 2.5	.025 x 200,000 = 5,000	17
Gage DeBerry	1,800	1,800/101,170x100 = 1.8	.018 x 200,000 = 3,600	17

Riverside Highland Water Company

1997 contribution of Lytle Creek basin wells = 70%;
Population served by four Riverside basin wells = 4,950 (total population served by entire system [16,500] minus population served by Lytle Creek wells [70% of 16,500 = 11,550]);
Apportioned population served by each of the four Riverside basin wells = 1,238 (4,950/4) (ref. 21).

Rubidoux Community Services District

Total population served by the entire system = 22,000;
Apportioned population served by each of the seven Riverside basin wells = 3,143 (22,000/7) (ref. 22).

Table 9 presents the 18 drinking water wells within 4 miles of the site that are subject to potential contamination, the apportioned populations served by these wells within each distance ring, and the distance-weighted population values for each distance ring (ref. 1, Table 3-12). The total distance-weighted population (9,385 + 2,122 + 1,306 = 12,813) divided by 10 yields a potential contamination factor value of 1,281.3 (ref. 1, Section 3.3.2.4).

Table 9
Potential Contamination Factor Value Calculations

Water Company and Well ID	Apportioned Population Within Distance Ring		
	1- to 2- mile	2- to 3-mile	3- to 4-mile
City of Riverside PUD			
Garner B	6,000		
Garner C	5,000		
Garner D	5,000		
Moore-Griffith	3,200		
Twin Springs	6,200		
Russell B	4,200		
Electric Ave.		6,000	
Van Buren #1			5,000
Van Buren #2			5,000
Gage DeBerry			3,600
Riverside Highland Water Company			
RN7		1,238	
Rubidoux Community Services District			
No. 1, No. 4, No. 5, No. 6, and No. 8	5 x 3,143 = 15,715		
No. 2 and No. 14		2 x 3,143 = 6,286	
TOTALS	45,315	13,524	13,600
Distance-Weighted Population	9,385	2,122	1,306

Level I Concentrations Factor Value: 0
Level II Concentrations Factor Value: 0
Potential Contamination Factor Value: 1,281.3

3.3.3 Resources

The City of Riverside's Fairmount Park #2 well, which is located approximately 0.5 mile northwest of the Alark Hard Chrome site, is used to fill Lake Evans (ref. 10, p. 6; ref. 16, p. 1; ref. 17, Attachment B). Lake Evans, which consists of three interconnected lakes (i.e., Fairmount Lake, Lake Evans, and a small pond adjacent to Lake Evans), is an urban fishing lake. In addition to having a resident population of largemouth bass, bluegill, green sunfish, and African clawed frogs, the lake is stocked by the California Department of Fish and Game with channel catfish and trout (ref. 26, Appendix D, p. D-6). Since there is a well within 4 miles of the site that is used to supply a major water recreation area, the resources factor is assigned a value of 5 (ref. 1, Section 3.3.3).

Resources Factor Value: 5

3.3.4 Wellhead Protection Area

There are no known wellhead protection areas within 4 miles of the site.

Wellhead Protection Area Factor Value: 0

SURFACE WATER MIGRATION PATHWAY

4.1 OVERLAND/FLOOD MIGRATION COMPONENT PATHWAY DESCRIPTION

4.1.1 General Considerations

4.1.1.1 Definition of Hazardous Substance Migration Path for Overland/Flood Component

Runoff from the Alark Hard Chrome site flows to the south and enters the storm drain system via the following two inlets: a pipe inlet at the southwest corner of the building and a curb inlet on Main Street approximately 200 feet from the site (ref. 26, Appendix E, p. E-2; ref. 10, p. 6). The probable point of entry (PPE) is located approximately 0.5 mile northwest of the site where the underground storm drain system discharges into Springbrook Channel. Springbrook Channel terminates at a diversion dam located at the eastern end of Fairmount Lake approximately 200 feet downstream of the PPE (ref. 3; ref. 26, p. 6, Figure 5-2). During most of the year, the dam prevents storm drain water from entering Fairmount Lake by diverting the water into an underground pipe that circumvents the lake and discharges onto open land approximately 2,000 feet west of the lake. However, during periods of heavy rainfall, the flow in Springbrook Channel exceeds the capacity of the diversion pipe, resulting in storm drain water flowing from the channel into Fairmount Lake (ref. 18; ref. 27). Fairmount Lake flows into Lake Evans approximately 750 feet downstream of the confluence of Springbrook Channel and Fairmount Lake. Lake Evans is approximately 2,000 feet long (ref. 3). Lake Evans empties into an underground outlet pipe, thereby ending the in-water segment (ref. 18). Figure 5 shows the in-water segment for the Alark Hard Chrome site (ref. 3; ref. 26, p. 6, Figure 5-2).

4.1.1.2 Observed Release

<u>Chemical Analysis</u>

An observed release by chemical analysis can be documented to surface water using 1992 sediment sampling results that indicate that total chromium concentrations have increased significantly above background levels in Springbrook Channel and Fairmount Lake downstream of the PPE for the Alark Hard Chrome site.

On October 22, 1992, a contractor to the U.S. EPA collected sediment samples from the following four locations: Sample 1, which is the background sample, was collected from Springbrook Channel approximately 300 feet upstream from the PPE; Sample 2 was collected at the PPE; Sample 3 was collected from Springbrook Channel approximately 300 feet downstream of the PPE on the upstream side of the diversion dam for Fairmount Lake; and Sample 4 was collected from Fairmount Lake immediately downstream of the diversion dam. Figure 6 shows the sediment sample locations (ref. 26, pp. 6 and 9, Figure 5-2). The samples were analyzed for total metals using Contract Laboratory Program (CLP) Routine Analytical Services (RAS) (ref. 26, p. 6). As shown in Table 10, total chromium was detected in the samples collected from Springbrook Channel downstream of the PPE (Sample 3) and from Fairmount Lake (Sample 4) at concentrations greater than three times background (Sample 1) (ref. 26, Appendix G, p. G-7). All QA/QC requirements were met for the four sediment samples (ref. 26, Appendix G, pp. G-1 through G-10).

Table 10
1992 Sediment Sampling Results Documenting an Observed Release to Surface Water

Sample ID#	Sampling Date	Sample Location	Total Chromium (mg/kg)	Reference
1 (background)	October 22, 1992	Springbrook Channel upstream of PPE	6.5	26, p. G-7
2	October 22, 1992	PPE	14.9	26, p. G-7
3	October 22, 1992	Springbrook Channel downstream of PPE	24.4	26, p. G-7
4	October 22, 1992	Fairmount Lake	28.7	26, p. G-7

Attribution

Total chromium was present in the spillage from the plating tanks (Source 1), the disposal pit (Source 2), and the underground tank (Source 3). Total chromium has also been detected in on-site soils at concentrations significantly above background levels (Source 4). Documentation of the presence of total chromium in each of the sources is presented in Section 2.4.1 (Hazardous Substances). In addition, during the 1982 Riverside County Department of Health investigation, "pools of chemicals" were observed outside the back door in the vicinity of the storm drain pipe inlet at the southwest corner of the building (ref. 5, p. 1). Analysis of a water sample collected from the pool indicated the presence of total chromium at a concentration in excess of 10 mg/l (ref. 10, Appendix A, p. A-5). Ponded water was observed in this area by a contractor to Alark during the March 1983 subsurface soil investigation. According to the contractor, the color of the water indicated the presence of chromium. Due to precipitation and inadequate drainage, the water would accumulate to a depth of 3 to 4 inches and then flow into the storm drain pipe inlet (ref. 7, p. 6, Figure 2).

A copy of Figure 5 is available at the EPA Headquarters Superfund Docket:

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A copy of Figure 6 is available at the EPA Headquarters Superfund Docket:

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4.1.2 Drinking Water Threat

4.1.2.1 Likelihood of Release

An observed release of total chromium from the Alark Hard Chrome site to Springbrook Channel and Fairmount Lake has been documented (see Section 4.1.1.2).

Likelihood of Release Factor Category Value: 550

4.1.2.2 Waste Characteristics

4.1.2.2.1 Toxicity/Persistence

Hazardous Substance	Source	Toxicity	Persistence (lake)	Toxicity/Persistence Factor Value	Reference
total chromium	1,2,3,4	10,000	1	10,000	2, p. B-4
hexavalent chromium	1,2,3,4	10,000	1	10,000	2, p. B-5
cadmium	1,2,3,4	10,000	1	10,000	2, p. B-5
cyanide	1,2,3,4	100	0.07	7	2, p. B-6
nickel	1,2,3,4	10,000	1	10,000	2, p. B-14

The toxicity/persistence factor value assigned for the drinking water threat is 10,000 (ref. 1, Section 4.1.2.2.1.3).

4.1.2.2.2 Waste Quantity

The hazardous waste quantity assigned from Sections 2.4.2 for Sources 1, 2, 3, and 4 is 8.78 (>0 + 7.6 + 1 + 0.18). The hazardous waste quantity factor value assigned for the drinking water threat is 10 (ref. 1, Table 2-6, Section 2.4.2.2).

4.1.2.2.3 Waste Characteristics Factor Category Value

Multiplying the toxicity/persistence factor value of 10,000 by the hazardous waste quantity factor value of 10 produces 1×10^5, which yields a waste characteristics factor category value of 18 for the drinking water threat (ref. 1, Table 2-7).

Waste Characteristics Factor Category Value: 18

4.1.2.3 Drinking Water Threat Targets

4.1.2.3.1 Nearest Intake

There are no known drinking water intakes along the in-water segment. A nearest intake factor value of 0 is assigned (ref. 1, Section 4.1.2.3.1).

4.1.2.3.2 Population

There are no known drinking water intakes along the in-water segment. A population factor value of 0 is assigned (ref. 1, Section 4.1.2.3.2).

4.1.2.3.3 Resources

Figure 5 shows the in-water segment for the Alark Hard Chrome site. There is one major recreation area within the target distance limit (TDL). Fairmount Lake and Lake Evans, which are interconnected, are urban fishing lakes. In addition to having a resident population of largemouth bass, bluegill, green sunfish, and African clawed frogs, the lakes are stocked by the California Deparment of Fish and Game with channel catfish and trout (ref. 26, Appendix D, p. D-6). A resources factor value of 5 is assigned (ref. 1, Section 4.1.2.3.3).

4.1.2.3.4 Targets Factor Category Value

Summing the nearest intake factor value, population factor value, and resources factor value produces a targets factor category value of 5.

Drinking Water Targets Factor Category Value: 5
Drinking Water Threat Score: 0.6

4.1.3 Human Food Chain Threat

4.1.3.1 Likelihood of Release

An observed release of total chromium from the Alark Hard Chrome site to Springbrook Channel and Fairmount Lake has been documented (see Section 4.1.1.2).

Likelihood of Release Factor Category Value: 550

4.1.3.2 Waste Characteristics

4.1.3.2.1 Toxicity/Persistence/Bioaccumulation Factor

Hazardous Substance	Source	Toxicity	Persistence (lake)	Food Chain Bioaccumulation (freshwater)	Factor Value	Reference
total chromium	1,2,3,4	10,000	1	5	$5x10^4$	2, p. B-5
hexavalent chromium	1,2,3,4	10,000	1	5	$5x10^4$	2, p. B-5
cadmium	1,2,3,4	10,000	1	5,000	$5x10^7$	2, p. B-4
cyanide	1,2,3,4	100	0.07	0.5	3.5	2, p. B-6
nickel	1,2,3,4	10,000	1	0.5	$5x10^3$	2, p. B-14

The toxicity/persistence/bioaccumulation factor value assigned for the human food chain threat is $5x10^7$, based on cadmium (ref. 1, Section 4.1.3.2.1.4).

4.1.3.2.2 Waste Quantity

The hazardous waste quantity assigned from Sections 2.4.2 for Sources 1, 2, 3, and 4 is 8.78 (>0 + 7.6 + 1 + 0.18). The hazardous waste quantity factor value assigned for the human food chain threat is 10 (ref. 1, Table 2-6, Section 2.4.2.2).

4.1.3.2.3 Waste Characteristics Factor Category Value

Multiplying the toxicity/persistence value for cadmium of 10,000 by the hazardous waste quantity factor value of 10 yields $1x10^5$, which is within the maximum allowable product of $1x10^8$ (ref. 1, Section 4.1.3.2.3). The value of $1x10^5$ multiplied by the bioaccumulation value of 5,000 yields $5x10^8$, which produces a waste characteristics factor category value of 100 for the human food chain threat (ref. 1, Table 2-7).

Waste Characteristics Factor Category Value: 100

4.1.3.3 Human Food Chain Threat Targets

4.1.3.3.1 Food Chain Individual

An observed release of total chromium from the Alark Hard Chrome site to Fairmount Lake, which is a fishery, has been documented (ref. 26, Appendix D, p. D-6, Appendix G, p. G-7). Total chromium has a bioaccumulation potential factor value of 5 (ref. 2, p. B-5). Since there is no observed release of a hazardous substance having a bioaccumulation potential factor value of 500 or greater, but there is a fishery present within the TDL, the food chain individual factor value is calculated by multiplying the dilution weight for Fairmount Lake by 20 (ref. 1, Section 4.1.3.3.1). The water level in Fairmount Lake, which is interconnected with Lake Evans, is mainly maintained by pumping groundwater from three wells drilled expressly for this purpose (ref. 10, p. 6; ref. 26, Appendix D, pp. D-6 and D-7). In addition, some water enters the lake from the City of Riverside storm drain system via Springbrook Channel (ref. 10, p. 6; ref. 26, Figure 5-2, Appendix D, p. D-7). The average annual flow of Springbrook Channel is less than 10 cubic feet per second (cfs) (ref. 18). The dilution weight for Fairmount Lake is, therefore, 1 and the assigned food chain individual factor value is 20 (1 x 20) (ref. 1, Table 4-13, Section 4.1.3.3.1).

4.1.3.3.2 Population

4.1.3.3.2.1 Level I Concentrations

Although an observed release has been documented to Fairmount Lake, which is a fishery, the hazardous substance in the release (i.e., total chromium) has a bioaccumulation potential factor value of less than 500 (ref. 2, p. B-5; ref. 26, Appendix D, p. D-6, Appendix G, p. G-7). Since no fishery within the TDL is subject to actual contamination, the Level I concentrations factor is assigned a value of 0 (ref. 1, Section 4.1.3.3).

4.1.3.3.2.2 Level II Concentrations

Although an observed release has been documented to Fairmount Lake, which is a fishery, the hazardous substance in the release (i.e., total chromium) has a bioaccumulation potential factor value of less than 500 (ref. 2, p. B-5; ref. 26, Appendix D, p. D-6, Appendix G, p. G-7). Since no fishery within the TDL is subject to actual contamination, the Level II concentrations factor is assigned a value of 0 (ref. 1, Section 4.1.3.3).

4.1.3.3.2.3 Potential Contamination

The California Department of Fish and Game stocks Fairmount Lake and Lake Evans with catfish in the warmer months and trout in the cooler months. During catfish season, the lakes are stocked once a month with 700 to 1,000 pounds of catfish. During trout season, the lakes are stocked twice a month with 500 to 700 pounds of trout (ref. 27). Since the lakes are stocked with at least 700 pounds of fish each month, this figure is used to calculate the annual human food chain production for Fairmount Lake and Lake Evans. Multiplying 700 pounds/month by 12 months/year yields 8,400 pounds of fish/year. This production rate is supported by a 1990 California Department of Fish and Game estimate that between 1,000 and 10,000 pounds of fish are caught from the lakes each year (ref. 14, p. 14).

The human food chain population value for the Fairmount Lake/Lake Evans fishery is 3 based on an annual fishery production of between 1,000 and 10,000 pounds (ref. 1, Table 4-18). The average annual flow of Springbrook Channel is less than 10 cfs, which yields a dilution weight of 1 for the fishery (ref. 1, Table 4-13; ref. 18). Multiplying the human food chain population value of 3 by the dilution weight of 1, and dividing by 10, yields a potential contamination factor value of 0.3 (ref. 1, Table 4-13, Section 4.1.3.3.2.3).

4.1.3.3.2.4 Population Factor Value

Summing the Level I concentrations factor value, Level II concentrations factor value, and potential contamination factor value produces a population factor value of 0.3.

4.1.3.3.3 Targets Factor Category Value

Summing the food chain individual factor value and the population factor value produces a targets factor category value of 20.3.

Human Food Chain Targets Factor Category Value: 20.3

Human Food Chain Threat Score: 13.53

4.1.4 Environmental Threat

The environmental threat was evaluated, but not scored, because there are no known sensitive environments associated with the in-water segment for the Alark Hard Chrome site (i.e., Springbrook Channel, Fairmount Lake, and Lake Evans) (ref. 27).

5.0 SOIL EXPOSURE PATHWAY

The soil exposure pathway was evaluated, but not scored, because all tanks associated with the electroplating process are no longer on site and a majority of the site surface, both inside and outside the building, is covered with concrete (ref. 8, p. 6, Figure 3, Attachment A, pp. A-1 and A-3; ref. 10, p. 6).

6.0 AIR MIGRATION PATHWAY

The air pathway was evaluated, but not scored, because the tanks associated with the electroplating process are no longer on site and a majority of the site surface, both inside and outside the building, is covered with concrete (ref. 8, p. 6, Figure 3, Attachment A, pp. A-1 and A-3; ref. 10, p. 6).

HAZARD RANKING SYSTEM
SUMMARY SCORESHEETS

SITE NAME: Alark Hard Chrome

CITY/COUNTY/STATE: Riverside, Riverside County, California

EPA ID #: CAD098229214

EVALUATOR: Kate Dragolovich **DATE:** January 11, 1999

LATITUDE: 33° 59' 30.79" N **LONGITUDE:** 117° 22' 1.88" W

	S	S^2
Groundwater Migration Pathway Score (S_{gw})	100	10,000
Surface Water Migration Pathway Score (S_{sw})	14.13	199.66
Soil Exposure Pathway Score (S_s)	Not scored	
Air Migration Pathway Score (S_a)	Not scored	
$S_{gw}^2 + S_{sw}^2 + S_s^2 + S_a^2$	XXXXXXX	10,199.66
$(S_{gw}^2 + S_{sw}^2 + S_s^2 + S_a^2) / 4$	XXXXXXX	2,549.92
$\sqrt{(S_{gw}^2 + S_{sw}^2 + S_s^2 + S_a^2)/4}$	XXXXXXX	50.50

GROUNDWATER MIGRATION PATHWAY SCORESHEET

Factor Categories and Factors

Maximum Likelihood of Release		Assigned Value	Score
1.	Observed Release	550	550
2.	Potential to Release		
	2a. Containment	10	
	2b. Net Precipitation	10	
	2c. Depth to Aquifer	5	
	2d. Travel Time	35	
	2e. Potential to Release [Lines 2a x (2b+2c+2d)]	500	
3.	Likelihood of Release (Higher of lines 1 or 2e)	550	550
	Waste Characteristics		
4.	Toxicity/Mobility	a	10,000
5.	Hazardous Waste Quantity	a	10
	Waste Characteristics (lines 4 x 5, then use Table 2-7)	100	18
	Targets		
7.	Nearest Well	50	5
8.	Population		
	8a. Level I Concentrations	b	0
	8b. Level II Concentrations	b	0
	8c. Potential Contamination	b	1,281.3
	8d. Population (lines 8a+8b+8c)	b	1,281.3
9.	Resources	5	5
10.	Wellhead Protection Area	20	0
11.	Targets (lines 7+8d+9+10)	b	1,291.3
12.	Aquifer Score [(Lines 3 x 6 x 11)/82,500][c]	100	100
	Groundwater Migration Pathway Score		
13.	Pathway Score (S_{gw}), highest value from line 12 for all aquifers evaluated)	100	100[c]

a Maximum value applies to waste characteristics category.
b Maximum value not applicable.
c Do not round to nearest integer.

SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT SCORESHEET

Factor Categories and Factors

DRINKING WATER THREAT

		Maximum		
	Likelihood of Release		Assigned Value	Value
1.	Observed Release		550	550
2.	Potential to Release by Overland Flow			
	2a.	Containment	10	
	2b.	Runoff	25	
	2c.	Distance to Surface Water	25	
	2d.	Potential to Release by Overlands Flow [lines 2a x (2b+2c)]	500	
3.	Potential to Release by Flood			
	3a.	Containment (Flood)	10	
	3b.	Flood Frequency	50	
	3c.	Potential to Release by Flood (lines 3a x 3b)	500	
4.	Potential to Release (Lines 2d+3c, subject to a maximum l of 500)		500	
5.	Likelihood of Release (Higher of lines 1 or 4)		550	550
	Waste Characteristics			
6.	Toxicity/Persistence		a	10,000
7.	Hazardous Waste Quantity		a	10
8.	Waste Characteristics (lines 6 x 7, then assign a value from Table 2-7)		100	18
	Targets			
9.	Nearest Intake		50	0
10.	Population			
	10a.	Level I Concentrations	b	0
	10b.	Level II Concentrations	b	0
	10c.	Potential Contamination	b	0
	10d.	Population (lines 10a + 10b +10c)	b	0
11.	Resources		5	5
12.	Targets (lines 9+10d+11)		b	5
13.	Drinking Water Threat [(Lines 5 x 8 x 12)/82,500, subject to a maximum of 100]		100	0.6

SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT SCORESHEET

		Maximum Value	Assigned Value
Factor Categories and Factors			
HUMAN FOOD CHAIN THREAT			
14.	Likelihood of Release (Same value as line 5)	550	550
	Waste Characteristics		
15.	Toxicity/Persistence/Bioaccumulation	a	50,000,000
16.	Hazardous Waste Quantity	a	10
17.	Waste Characteristics (Toxicity/Persistence x Hazardous Waste Quantity x Bioaccumulation, then assign a value from Table 2-7)	1,000	100
	Targets		
18.	Food Chain Individual	50	20
19.	Population		
	19a. Level I Concentrations	b	0
	19b. Level II Concentrations	b	0
	19c. Potential Contamination	b	0.3
	19d. Population (lines 19a + 19b + 19c)	b	0.3
20.	Targets (lines 18 + 19d)	b	20.3
	Human Food Chain Threat Score		
21.	Human Food Chain Threat [(Lines 14 x 17 20)/82,500 subject to a maximum of 100]	100	13.53

SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT SCORESHEET

		Maximum Value	Assigned Value
Factor Categories and Factors			
ENVIRONMENTAL THREAT			
	Likelihood of Release		
22.	Likelihood of Release (Same value of line 5)	550	_______
	Waste Characteristics		
23.	Ecosystem Toxicity/Persistence Bioaccumulation	a	_______
24.	Hazardous Waste Quantity	a	_______
25.	Waste Characteristics (Ecosystem Tox./Persistence x Hazardous Waste quantity x Bioaccumulation, then assign a value from Table 2-7)	1,000	_______
	Targets		
26.	Sensitive Environments		
	26a. Level I Concentrations	b	_______
	26b. Level II Concentrations	b	_______
	26c. Potential Contamination	b	_______
	26d. Sensitive Environments (lines 26a + 26b + 26c)	b	_______
27.	Targets (Value from line 26d)	b	_______
	Environmental Threat Score		
28.	Environmental Threat Score [(lines 22 x 25 x 27)/82,500 subject to a maximum of 60]	60	not scored
SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT SCORE FOR A WATERSHED			
29.	Watershed Score [(Lines 13 + 21+ 28), subject to a maximum of 100]	100	14.13 c
SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT SCORE			
30.	Component Score (Sof) (Highest score from Line 29 for all watersheds evaluated, subject to a maximum of 100)	100	14.13 c

a Maximum value applies to waste characteristics category.
b Maximum value not applicable.
c Do not round to the nearest integer.